# A MULTIDISCIPLINARY PROJECT FOR INTRODUCING VEGETABLE GRAFTING IN THE U.S.A.

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Vegetable grafting is an established technology, practiced for many years in East Asia and Europe, to overcome soil-borne diseases and pests associated with intensive cultivation. During the past decade, the use of vegetable grafting has been introduced to other countries including Eastern Europe, Northern Africa, Central America, and North America. In the U.S.A., grafted seedling technology is limited to greenhouse hydroponic growers for yield enhancement and to small organic producers for disease and pest control. Introduction of the technology to open fields has potential efficacy as an IPM tool to reduce soil fumigants, but there are limitations associated with some unique features of U.S. open field fruiting vegetable production (tomato, eggplant, melons, and cucumbers).

To overcome the limitations, researchers at the University of Arizona, in collaboration with USDA ARS, U.S. Horticultural Research Lab (Fort Pierce, Florida), work on multidisciplinary projects in the area of agronomy, controlled environment agriculture, plant pathology and agricultural economics. Specifically, we are conducting research and extension integrated projects that include 1) research field trials, 2) commercial field trials/demonstrations, 3) commercial rootstock screening for nematode resistance, 4) development of seedling production techniques, and 5) information dissemination through workshops and website. We selected tomato and muskmelon as our model crops, although grafting has been effectively practiced for other crops, including watermelon, cucumber, and eggplant.

In the Fall of 2006 and Spring of 2007, we conducted small trials to compare grafted and non-grafted 'Olympic Gold' muskmelon plants using a field plot infested with charcoal rot, *Pythium*, and root knot nematodes. Collectively, the results indicated that grafting to an interspecific hybrid squash (*Cucurbita maxima* × *Cucurbita moschata* cv.'Tetsukabuto') achieved tolerance over charcoal rot (*Macrophomina phaseolina*), *Pythium aphanidermatum*, and root knot nematodes (*Meloidogyne spp.*). In the Spring of 2008, another small trial was conducted in the same infested field plot to compare three different rootstocks. Grafted plants yielded 85 - 130% more than non-grafted plants when grafted to interspecific squash rootstocks ('Tetsukabuto' or 'Strongtosa'). A yield increase was not observed when 'Olympic Gold' was grafted to a muskmelon rootstock ('DRO5018'). There was no significant difference in visual scores of nematode infection regardless of grafting or rootstock.

In the Fall of 2007, using 'Tetsukabuto' rootstock, we conducted a commercial trial for 'Olympic Gold' muskmelon in fields located in Wenden, Arizona. For this trial, we used a conventionally fumigated plot (with Vapam and Telone) and a non-fumigated plot managed organically. Despite delays in transportation and planting, grafted seedlings yielded at a comparable level to direct-seeded plants. Preliminary economic analysis was conducted, but because of the minimal yield increase, no economic benefit was observed. The commercial trial also helped us to assess issues we currently face to introduce this technology to U.S. open field production, which are 1) limited local propagation capability, 2) competition amongst seed companies and propagators, 3) high price for seeds and seedlings, and 4) limited information on efficacy. As part of a strategy to overcome the first issue of limited propagation capability, we developed a cold storage method of grafted seedlings. Two experiments were conducted in 2007 and 2008, showing that 'Olympic Gold' muskmelon seedlings can be held at $12^{o}$C up to 4 weeks without losing regrowth ability and that grafted plants can be stored longer than non-grafted plants. This technique should help propagators with limited grafting capacity produce the larger number of grafts required for open field production. More discussion will be made on issues and potential resolutions during the presentation.

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